APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/427,815	10/27/1999	DAVID P. ROSSUM	17002-01400U	3803

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EXAMINER
GRAHAM, ANDREW R

ART UNIT	PAPER NUMBER
2697	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/427,815	ROSSUM, DAVID P.
	Examiner	Art Unit
	Andrew R Graham	2697

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-33_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-33_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

DETAILED ACTION

Drawings

1.   The drawings in this application are objected to by the

Draftsperson as informal. The reasons for said objection are listed

on the enclosed copy of the Notice of Draftsperson's Patent Drawing

Review, PTO form 948. A proposed drawing correction or corrected

drawings are required in reply to the Office action to avoid

abandonment of the application. The objection to the drawings will

not be held in abeyance.

Specification

2.   The spacing of the lines of the specification is such as to make

reading and entry of amendments difficult. New application papers

with lines double spaced on good quality paper are required.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the

basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically
> disclosed or described as set forth in section 102 of this title, if the
> differences between the subject matter sought to be patented and the prior
> art are such that the subject matter as a whole would have been obvious at
> the time the invention was made to a person having ordinary skill in the
> art to which said subject matter pertains. Patentability shall not be
> negatived by the manner in which the invention was made.

4.   **Claims 1-33** are rejected under 35 U.S.C. 103(a) as being

unpatentable over Orban (USPN 6337999) in view of applicant's admitted

known prior art.

Regarding **Claim 1,** Orban discloses a digital clipper that uses

upsampling, downsampling, and summation to decrease aliasing and

improves the accuracy of such an operation as compared to other

methods of clipping. Specifically, Orban teaches a method of first

upsampling an input digital signal, clipping the result of this

interpolation, and then downsampling the modified signal before adding

it to a delayed version of the original input signal (col. 3, lines 5-

56). The upsampling and downsampling portions of this process read on

"converting a signal to differing sample rates". The digital data

that this process is performed on reads on "receiving, at a first

sample rate, a plurality of data points". After the upsampling, the

device shown in Figure 2 also includes a low pass filter (400) for

removing the extra images caused by the upsampling circuit (200) (col.

3, lines 12-14). To remove unwanted images, the filter (400) must

inherently be operating on the output signal of the upsampler with the

knowledge of the parameters if the input signal in order to "know"

what part of the output signal needs to be removed (col. 3, lines 11-

13). The standard parts of a digital signal include a passband, which

includes the frequencies with the image information, as well as a

guardband or transition band. As the system initially receives the

entire input signal and the filter is arranged to know the parameters

of the passband of the image, this inherently means that the system

has knowledge of the details of the initial transition band of the

input signal as well. This inherent knowledge, along with the

function of the filter (400) read on "operating on said plurality of

data points to associate said signal with a predetermined set of

parameters" and "said set of parameters including a first transition

band". The operations and the output of the upsampler (400) read on

"varying the sample rate associated with said first signal by

interpolation with an interpolator" and "a second signal is produced

having a sequence of data samples approximating the first signal".

In regards though to the specifics of the circuitry of his

system, Orban does not specify:

- the interpolator that varies the sample rate has a second

  transition band associated with it

- the width of this second transition band is a function of the

  spectral separation of the transition band and image of the

  input signal

In the specification of the application, the applicant discloses

several examples of previous forms of sample rate converters that are

well known in the art. Specifically, the applicant discloses the

various components of previously well known sample rate converters,

including a variety of circuits referred to as "interpolation filters"

(page 4, lines 14-16, 20, 31 and Figs. 1B, 2B, 2E, 3C, 3F). The two

different versions of these mentioned in the specification as

"classical" single stage interpolators are a "less conservative" one,

which has a transition band equal to twice the guardband of the input

signal and a "more conservative" one, which has a transition band

equal to the guardband of the input signal (page 3, lines 21-25).

These two types of interpolator filters read on "an interpolator

having associated a second transition band, with the width associated

with said second transition band being a function of a spectral

separation of said first transition band and said image".

To one of ordinary skill in the art at the time of the invention,

it would have been obvious to include an interpolation filter in the

system of Orban as disclosed as prior well known art in the

specification of the application. As discussed previously, Orban

discloses separate components for interpolating and filtering the

input signal; the motivation behind substituting a combined

interpolation filter for the separate interpolator and filter would

have been that it would have made each handling of the input values

more efficient. Instead of interpolating a series of values and then

later filtering the same values, the interpolator filter would have

performed both operations on the series of values while only handling

the values once.

Regarding **Claim 2,** Orban discloses that the filters (400-403) of

Figure 2 are half-band, polyphase, symmetrical finite impulse response

(FIR) filters (col. 3, lines 66-67 and col. 4, lines 1-3). In dealing

with digital signals, the standard operating procedure of an FIR

involves convoluting a finite set of coefficients with a finite and

equal number of values from the input signal. The inherency of this operation reads on "producing each data sample associated with said second signal by convolving a predetermined finite number N of data points with an equal number of coefficients".

Regarding **Claim 3,** the standard operation of a digital FIR filter, such as that disclosed by Orban, inherently involves convolving the input data with the coefficients of the filter (col. 3, lines 66-67, and col. 4, lines 1-3). The very definition of a finite impulse response includes the feature that the coefficients of the realizing filter vary according to the input time currently being processed. This reads on "coefficients vary as a function of the temporal spacing between the output point and the corresponding input points".

Regarding **Claim 4,** the upsamplers (200-203) in the second embodiment of the invention increase the sample rate of the input signal (Figure 2 and col. 3, lines 60-67 and col. 4, lines 1-7). This reads on "varying said sample rate increases said sample rate".

Regarding **Claim 5,** the downsamplers (250-253) in the second embodiment of the invention decrease the sample rate of the input signal (Figure 2 and col. 4, lines 18-24). This reads on "varying said sample rate decreases said sample rate".

Regarding **Claim 6,** the upsamplers (200-203) of the second embodiment specifically double the sample rate of the input signal, which reads on "operating on said plurality of data points includes

up-sampling said plurality of data points by a factor of two" (Figure

2 and col. 3, lines 60-67 and col. 4, lines 1-7).

Regarding **Claim 7**, filters (230-233) are specifically polyphase

halfband FIR filters, which reads on "operating on said plurality of

data points includes filtering said plurality of data poins with a

half-band filter"(col. 4, lines 22-24).

Regarding **Claim 8**, interpolator-filter combinations were

discussed previously in regards to Claim 1. Decimation being the

inverse of interpolation, decimation filters would be of the same

processing nature as interpolation filters. Orban discloses filter-

decimator pairs (230/250,231/251,232/252,233/253) that half-band

filter an input signal and then decrease the sampling rate by a factor

of two (col. 4, lines 18-24). Combined, following the same arguments

and teachings of well known prior art as discussed previously, these

half-band filter/downsampler pairs and their signal processing

features read on "operating on said plurality of data points includes

decimating said plurality of data points with a half-band decimator".

Regarding **Claim 9**, Figure 2 of Orban shows one embodiment of his

system that decimates the signal received from upsamplers

(200,201,202,203) with half-band filter/decimator pairs

(230/250,231/251,232/252,233/253) (col. 4, lines 18-24). As discussed

in regards to Claims 6 and 8, this reads on "decimating a plurality of

data points output by said interpolator with a half band decimator,

with varying said sample rate occurring after receiving said plurality

of data points and before decimating said plurality of data points".

Regarding **Claim 10,** the filters (400-403) that follow the upsamplers (200-203) are all half-band, polyphase symmetrical finite impulse response filters, which reads on "operating on said plurality of data points to associate said signal includes filtering the same with a finite impulse response filter" (col. 3, lines 66-67 and col. 4, lines 1-3).

Regarding **Claim 11,** the final processing stages of the embodiment shown in Figure 2 include a filter (420) that is a fifth order infinite impulse response (IIR) filter (col. 4, lines 37-45). This reads on "operating on said plurality of data points to associate said signal includes filtering the same with an infinite impulse response filter".

Regarding **Claim 12,** please refer to the like teachings of Claims 1, 6, and 7.

Regarding **Claim 13,** the embodiment of the system of Orban shown in Figure 2 includes several sequential pairs of upsamplers and filters (col. 3, lines 64-67 and col.4, lines 1-7). Specifically, Upsampler (200) outputs the signal received by filter (400), which in turn provides the input to upsampler (201). Upsampling is a specific form of interpolation, and such a combination would have made obvious the possibility of including other forms of interpolation. The sequence of components, specifically as disclosed though reads on "said halfband filtering is done in conjunction with upsampling said plurality of data points; and said interpolation follows said upsampling and halfband filtering".

Regarding **Claim 14**, Orban discloses a system that involves
separate processing circuits for upsampling, filtering, and
downsampling. In the upsampling sequence shown in the embodiment in
Figure 2, the FIR filter (400) performs the operation of half-band
filtering the input signal without performing any other function, and
the output of this component (400) is then passed along to upsampler
(201), which interpolates the input signal (col. 1, lines 60-67 and
col. 4, lines 1-7). This specific part of the sequence reads on "said
halfband filtering is done, without upsampling, on said plurality of
datapoints; and said interpolating follows said halfband filtering".

Regarding **Claim 15**, the embodiment of the system of Orban shown
in Figure 2 includes an interpolator (201), where the output of this
interpolator input into a halfband filter (401). This part of the
processing sequence reads on "said halfband filtering follows said
interpolating".

Regarding **Claim 16**, the embodiment of the system of Orban shown
in Figure 2 includes an upsampler (200) in series with a half-band FIR
filter (400) and another upsampler (201). Included further down the
signal path are another half-band filter (230) and a decimator (250).
With, again, the understanding that an upsampler is a specific form of
interpolator, this sequence of components reads on "said half-band
filtering is done in conjunction with upsampling" and said
interpolating follows said halfband filtering" and "halfband filtering
and decimation following said interpolation".

Regarding **Claim 17**, Orban specifically discloses that the second embodiment is intended to be carried out by any conventional audio clipper that is realized by digital signal processing (col. 5, lines 29-32). Digital signal processing is well known in the art to be conducted by various types of computers, using various components, ranging from microprocessors to specific digital signal processors. These components generally all require some form of program to operate, which inherently reads on "A computer program product". The details of such systems, especially ones that convert data to and from different sampling rates inherently require some form of temporary and/or permanent data storage, which reads on "a computer-readable storage medium for storing code". Regarding the remaining features of the claim, please refer to the like teachings of Claim 1.

Regarding **Claim 18**, please refer to the like teachings of Claim 6. Regarding **Claim 19**, please refer to the like teachings of Claim 7. Regarding **Claim 20**, please refer to the like teachings of Claim 8. Regarding **Claim 21**, please refer to the like teachings of Claim 8. Regarding **Claim 22**, please refer to the like teachings of Claims 10 and 11. Regarding **Claim 23**, please refer to the like teachings of Claims 1, 6, 7, and 17. Regarding **Claim 24**, please refer to the like teachings of Claim 13. Regarding **Claim 25**, please refer to the like teachings of Claim 14. Regarding **Claim 26**, please refer to the like teachings of Claim 15. Regarding **Claim 27**, please refer to the like teachings of Claim 16.

Regarding **Claim 28**, the applicant discloses as part of the
background of the specification that Nth order FIR sample rate
converters are known in that art fall under the category of
'intermediate quality' converters (page 8, lines 4-10). The applicant
also gives a formula for determining the complexity of the involved
computation of such a converter (Page 8, lines 7-10). This inherently
reads on "interpolator is an FIR Nth order sum of products
interpolator with linear interpolation of coefficients".

Regarding **Claim 29**, please refer to the like teachings of Claim
28.

Regarding **Claim 30**, the details of the widths of the transition
bands of classical type of interpolation filters were discussed in
reference to Claim 1. One of these admitted, well known interpolation
filters involved a transition band that was twice the width of the
guardband of the input signal (page 4, lines 14-15). Looking at
Figure 2B, it can be seen that this width spans from the highest edge
of the lowest frequency image to the lowest edge of the passband of
the next image. This reads on "interpolator has a transition band
beginning adjacent the top of a passband and ending adjacent the
bottom of a passband image".

Regarding **Claim 31**, please refer to the like teachings of Claim
30.

Regarding **Claim 32**, one of the specific filtering components that
Orban teaches is a fifth-order IIR filter with a sixth-order allpass
group detector (col. 4, lines 39-42). With this arrangement in place,

it would have been inherent that different orders of allpass detectors

would have been usable in the system. Different orders perform the

same general processing function, except with different numbers and

arrangement of components, and with slightly variant output responses.

The specifics of each of the different orders of allpass components

would have been well known in the art, thus making evident the

advantages and disadvantages of different orders in use with different

systems. This reads on "said halfband filter is an IIR filter

composed of first order allpass blocks".

Regarding **Claim 33**, please refer to the like teachings of Claim

32.

Conclusion

The prior art made of record and not relied upon is considered

pertinent to applicant's disclosure.

White (USPN 5808924) discloses an allpass, first-order decimating

IIR filter. Wang (USPN 5929795) discloses a digital processor for

decreasing distortion that includes the separate operations of

upsampling, filtering, and downsampling.

Any inquiry concerning this communication or earlier

communications from the examiner should be directed to Andrew Graham

whose telephone number is (703) 308-6729. The examiner can normally

be reached on Monday-Friday (7:30-4:30), excluding alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful,

the examiner's supervisor, Kimberly Williams, can be reached at (703)

305-4863. The fax number for the organization where this application

or proceeding is assigned is 703-872-9314 for regular communications,

and 703-872-9315 for After Final communications.

Any inquiry of a general nature or relating to the status of

this application or proceeding should be directed to the receptionist

whose telephone number is (703) 305-3900.

Andrew Graham

Andrew Graham
Examiner
A.U. 2697

KAWilliams

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